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Maritimes Region

Région des Maritimes

Proceedings of a Maritimes Science Advisory Process to Review DEPOMOD Predictions Around Select Aquaculture Sites in Southwest New Brunswick

15-16 February 2012

Peter Cranford
Meeting Chairperson

Compte rendu d'un processus d'avis scientifique de la Région des Maritimes pour l'examen des prévisions du modèle DEPOMOD aux alentours des sites aquacoles sélectionnés dans le sud-ouest du Nouveau-Brunswick

15-16 février 2012

Peter Cranford
Président de réunion

Bedford Institute of Oceanography / Institut océanographique de Bedford
1 Challenger Drive, P.O. Box 1006 / 1 Challenger Drive, C.P. 1006
Dartmouth, Nova Scotia B2Y 4A2 / Dartmouth (Nouvelle-Écosse) B2Y 4A2

September 2012

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A Maritimes Science Advisory Process to review the DEPOMOD predictions versus observations of sulphide concentrations around select aquaculture sites in southwest New Brunswick was held on 15-16 February, 2012, at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. Participation in this meeting included Fisheries and Oceans Canada, aboriginal organization, non-government organizations, academia, Nova Scotia and New Brunswick provincial government, as well as industry representatives.

SOMMAIRE

Un processus d'avis scientifique de la Région des Maritimes pour l'examen des prévisions du modèle DEPOMOD par rapport aux observations des concentrations de sulfures aux alentours des sites aquacoles sélectionnés dans le sud-ouest du Nouveau-Brunswick a eu lieu les 15 et 16 février 2012 à l'Institut océanographique de Bedford à Dartmouth, en Nouvelle-Écosse. Les participants à cette réunion étaient notamment Pêches et Océans Canada, une organisation autochtone, des organisations non gouvernementales, le milieu universitaire, les gouvernements provinciaux de la Nouvelle-Écosse et du Nouveau-Brunswick, ainsi que des représentants de l'industrie.

INTRODUCTION

The Chair of the meeting, P. Cranford, welcomed participants and thanked them for coming to the Fisheries and Oceans Canada (DFO) Science Advisory Process to review the DEPOMOD predictions versus observations of sulphide concentrations around select aquaculture sites in southwest New Brunswick. Participants introduced themselves (Appendix 3), and the chair introduced the invited reviewers: Jon Grant from Dalhousie University, Gary Bugden from DFO in the Maritimes Regions and Jon Chamberlain from DFO in the Pacific Region. The Chair encouraged other participants to provide a critical review of the information presented based on their knowledge and expertise.

The Chair noted that this was a science peer-review and advisory meeting, meaning the primary goals of the meeting was 1) to provide a thorough scientific review of the information presented in the working paper to ensure the information was complete, and 2) to review the science advisory report based on this information.

The Chair provided a brief overview of the Canadian Science Advisory Secretariat (CSAS) Science Advisory Process and invited the participants to review the meeting Terms of Reference (Appendix 1). The objectives of the meeting were reviewed:

Determine the effectiveness of DEPOMOD (i.e. how precise is the model when compared to post impact monitoring) in predicting:

- intensity of organic enrichment from marine finfish aquaculture sites in the Maritimes Region;
- geographic location of impact from marine finfish aquaculture sites in the Maritimes Region; and
- magnitude of area (in m2) of impact from marine finfish aquaculture sites in the Maritimes Region.

Identify any alternative model(s) that would more accurately predict organic enrichment intensity, magnitude and area on impact from marine finfish aquaculture sites in the Maritimes Region.

The Agenda (Appendix 2) was reviewed, with no further additions or corrections. This Proceedings report is the record of the discussion of the meeting.

PRESENTATIONS AND RELATED DISCUSSIONS

Working Paper: Chang, B.D., F.H. Page, R.J. Losier, and E.P. McCurdy. 2012. Predicting Organic Enrichment under Marine Finfish Farms in Southwestern New Brunswick, Bay of Fundy: Comparison of Model Predictions with Results from Spatially-intensive Sediment Sulfide Sampling. CSA Working Paper 2012/010.

Presentation: Project Introduction/Background
Presenter: B. Chang
Rapporteur: L. Bennett

Presentation Highlights

Marine fish farming in the southwestern New Brunswick area of the Bay of Fundy began in 1978. Of 95 licensed finfish farms in southwestern New Brunswick, 85 are licensed salmon farms with approximately two-thirds actively growing salmon in 2012. The Environmental Monitoring Program (EMP) for marine finfish aquaculture industry in New Brunswick requires monitoring of sediment sulphide concentrations under existing farms from August 1 – October 31 each year (Tier 1 sampling). Sulphide concentrations are used to classify a site along an Oxic-Anoxic scale. Farms receiving a rating of Hypoxic B or worse (>3000 µM sulphides) are required to complete Tier 2 sampling.

DEPOMOD, a model which predicts organic enrichment at fish farms, has been used to predict the suitability of proposed farm sites in Scotland and Canada. The relationship between sediment sulphide concentration and organic carbon deposition as presented in Hargrave et al. 2008 was reviewed. DEPOMOD data requirements include bathymetry, cage dimensions and locations, feed rates and current speed and direction. The output of DEPOMOD is displayed as deposition rate per grid cell measured in g C m^{-2} d^{-1} units.

A description and data requirements of an alternative simple model of carbon deposition were presented.

Sampling methods at the five sampling sites were presented. Study participants were acknowledged.

Discussion

There were no comments or questions concerning this presentation.

Presentation: DEPOMOD Predictions
Presenter: B. Chang
Rapporteur: L. Bennett

Presentation Highlights

Sediment sampling was completed at five operating salmon farms (sites A, C, D, G, and H) in southwest New Brunswick. Feed rates at the time of sediment sampling and current data from 2-3 current meter deployments in the vicinity of each farm were used as inputs to the model. Contour plots of results were presented. Results indicate 1) higher current speeds typically result in smaller areas with elevated impacts and lower maximum deposition rates; 2) highest impacts are predicted under the cage array; 3) predicted carbon deposition is lower when the

resuspension component of DEPOMOD is activated; and 4) for farms that are harvesting, feed rates at the time of harvesting may not be the appropriate feed rate to use in DEPOMOD.

Discussion

Site Specific

Site A

A participant inquired whether there was variation in current speed and whether currents are dominated by storm events. It was noted that while there is some seasonality in the data, the currents are primarily dominated by the tidal cycle in SWNB.

Site D

It was questioned whether differences in current speeds at site D resulted from the timing of the measurements (i.e. June-August and November). Data concerning temporal differences in current meter data has not been analysed; however, the temporal issue can not be discredited. To determine if there is a specific time of year that meters should be deployed it was noted that the timing and duration of meter inputs need to be considered.

Site G

Unlike the other four sampling sites which have three current measurements, site G has a single current measurement collected near the bottom. It was questioned whether this single data point would impact DEPOMOD predictions. It was noted that due to the shallow depth of the site, the use of current velocities from a single depth is not expected to affect the results.

General

An offset in the results of the contour plots in relation to cage locations was noted for several sites. There may be a resolution issue as the model outputs the deposition rate at the center of each grid cell (10 × 10 m in most cases), while the locations of the cage centres do not correspond exactly to the grid cell centers.

A participant inquired whether the ability to accurately predict current data is impacted by the presence of the cages within a site. The presenter indicated that a sensitivity analysis will be completed on available data to determine the impact of the presence of the cage array on current data measurements. In this study, current meters were deployed just outside of the cage arrays, to avoid cage effects.

Presentation: Comparisons of DEPOMOD Predictions with a Simple Model and Sediment Data
Presenter: B. Chang
Rapporteur: L. Bennett

Presentation Highlights

Simple Model

A simple model was presented as an alternative approach to predicting organic carbon deposition rates at the five sampling sites. The simple model is based on circular buffer areas drawn around the cages with the diameter of the buffer area estimated to be the horizontal displacement of particles from the point of release until they hit the sea floor. Horizontal displacement is calculated using average site depth, current speed at mid depth, and sinking rates. This model provides an estimate of the area, and not the intensity, of impact under a cage array.

Data Collection

Intensive sediment sampling was conducted at three of the five farms. Samples were collected within and extending up to 100 m away from the cage arrays. At site A, sediment sampling was conducted twice: in September 2005 and May 2006. Details on the sampling at these sites are reported in Chang et al. 2011. Sediment samples at the remaining two sites were collected as part of EMP Tier 2 monitoring. Sediment samples were collected along the perimeter and inside the cage arrays, but not away from the cage arrays.

Comparison of DEPOMOD, Simple Model and Data Collection Results

A comparison of DEPOMOD predictions, simple model and sediment sampling results yielded the following results: 1) while the locations differed, simple model and DEPOMOD predictions of estimated areas of impacted seafloor were comparable; 2) there is considerable scatter in the relationship between DEPOMOD predictions and sulphides; 3) there is no relationship between DEPOMOD predictions of maximum deposition rates and the maximum sulphide concentrations per site; 4) at sites where DEPOMOD predicted carbon deposition rates less than 5 g C m^{-2} d^{-1} eighty five percent of sulphide concentrations were less than 3000 µM; however, when DEPOMOD predicted carbon deposition rates greater than 5 g C m^{-2} d^{-1} only sixty four percent of sulphide concentrations were greater than 3000 µM; 5) DEPOMOD predictions of spatial extent of seafloor with elevated impacts did not agree well with the extent of seafloor with elevated sulphide concentrations at most sites; and 6) overall, measured sediment sulphide increases with DEPOMOD carbon deposition rate. The relationship is a power curve.

Discussion

Clarification was sought on data collection methods and locations. Sediment samples taken by DFO at sites A, C, and D were collected within the cage and up to 100 m away from the cage arrays, using grab samplers deployed from a boat. Samples taken at sites G and H were taken as part of the EMP Tier 2 sampling and were collected by divers within but not outside of the cage arrays. It was noted that despite some variability the cages at site A were in the same location between the two sampling periods at this site.

Difference in grain size between sites was proposed as an explanation for the scatter in the graphs which display measured sulfide concentration and predicted carbon deposition rates as

higher accumulation has been noted in fine sediments. It was noted that grain size has not been examined. It was proposed that currents and waves should also be examined when considering differences between predicted and observed results.

It was suggested that the use of additional indicators would aid in the understanding of results. While videos and/or still photos are required by the province to provide an indication of habitat, sediment sulphide concentration is the only indicator used by the province to classify environmental performance of sites.

It was noted that while the focus of this review is on near field impacts the focus of aquaculture assessments needs shift to far field impacts due to the potential impacts on communities.

There was a discussion concerning the applicability of the results to the Maritimes Region. The results of the field program are highly variable. The limited number of locations sampled may not be sufficient to provide an accurate description of benthic impacts throughout the Maritimes Regions and may limit its applicability to other aquaculture sites.

It was clarified that the mean sulphide concentrations (of three subsamples at each sampling location) is compared with a model prediction of carbon flux in the corresponding 10 m X 10 m grid cell. It is recommended that additional information regarding the approach be provided as such comparisons without clear explanations of the limitations and assumptions of the approach are prone to misinterpretation.

Two time periods (September 2005 and May 2006) were examined at site A, with the feed input to the farm greater during the later period. Biomass on the farm increased from approximately 480 to 1400MT; however, the average feed input only increased from 495 to 749 kg/c/d. It was noted that despite providing a description of the highly variable nature of feed input rates across the farm, the results do not identify specific cages in the array or specific feed data. Additional information would be useful when considering the fine scale nature of the impact analyses.

There was a discussion concerning the validity of using carbon deposition rates as an indicator of sediment sulfide concentrations as the results of this study are attempting to relate two different variables. The relationship of predicted carbon deposition with near field sulphides is reasonable at a hypothetical level, but is questionable at a practical level. There are clusters of high sulphide levels with high DEPOMOD predictions which suggests that DEPOMOD predictions could be used to estimate classes of sulphide levels. However, the confidence of these classes would be a function of the variance in the empirical relationship between DEPOMOD and sulphide. If the relationship between carbon deposition and sediment sulfide concentrations is not clearly understood there was a question of whether to discard the results if the reason for inconsistency between predicted and observed results could not be explained.

It was suggested free sulphide may not be the most appropriate sulphide indicator. Free sulphide tends to be instantaneous (reflect recent organic enrichment conditions) and therefore can show high temporal variability. It was recommended that an alternative indicator that reflects steady state conditions should be considered. However, it was also noted that these topics were discussed in several previous science advisory meetings where total "free" sulfide was selected as the more practical method.

It was noted that the presented data does not convey the magnitude of increase in overall carbon loading to the seabed as a result of increasing waste feed rates. The effects of the percentage of waste feed on overall carbon flux tends to focus on calculations of the proportional increase in the area subject to a flux of greater than 5 g C m^{-2} d^{-1} rather than the

increase in overall mass of carbon delivered to the seabed through waste pellets or maximum predicted flux of carbon as a result of waste feed pellets. A participant commented that the area of impact is considered as it aids in making regulatory decisions.

There was a discussion concerning the limitations and assumptions of the contouring approach. Limitations and assumptions require explanation and consideration. The methodology by which the field data and model predictions are compared when considering the magnitude of area uses calculated areas within each of the EMP categories (Oxic - Anoxic) and related flux values from Hargrave et al. 2008. A participant noted that using these boundaries for model/field comparisons and the presentation of results rather than completing a more comprehensive analysis of possible relationship limits the effectiveness of the review. The interpolation of both field and model outputs tends to introduce an added layer of data manipulation that may not be required during the initial phase of the analysis. Further, the use of the nearest neighbour mapping approach artificially creates a boundary which is compared against another area. It was noted however, that the plot does indicate that the broader potential impacts have been captured by the monitoring which is being compared within a known boundary area. It was suggested that an explanation as to why this approach was used be provided.

Several factors, including inaccurate feed input data, changes in currents, waves, length of current meter record, winter storms, cage movement and resuspension, were proposed to explain why high sulfide concentrations did not align with high carbon deposition predictions.

There was a discussion concerning the impact of feeding scenario on model outputs. DEPOMOD is typically run assuming continuous input of feed. Daily feed rates per cage must be provided. However, the model is capable of accepting temporally varying feed inputs. The relationship between the feed rate and the waste deposition rate is linear, so separate model runs are not required for every feed rate of interest.

There was a discussion regarding the resuspension component of DEPOMOD. It was noted that the ability to model resuspension of particles is challenging as resuspension speed is likely to vary with particle size, cohesiveness, sheer force, biodegradation, and bottom and sediment type. It was proposed that the difference between fate and effect of particles receive further attention.

The concept of sediment memory was discussed. Particles could reside and degrade on the seafloor with consequent oxygen demand for a period of time prior to being transported away from the site through resuspension processes (e.g. storm events), however, the observed effects of that residence time remained. DEPOMOD would generally not account for the effects of temporary particle residence in the assessment of effects. It was recommended that the potential impact of temporary particles and how to account for impacts that may occur prior to but are not present at the time of sampling receive further consideration.
It was noted that the moisture content of food has changed from 10% to 5% since DEPOMOD was developed. Decreased moisture content would result in additional carbon being added to the system. Likewise, feeding regimes can vary greatly per farm. As feeding regimes change and new protein sources are used, carbon percentages may change and account for some of the variability between observes and predicted results.

The lag time between carbon deposition and the presence of site impacts has not been identified. Additional sampling to determine the appropriate time to sample (e.g. one month prior or after peak production) is recommended.

It was recommended that a mass-balance analysis be completed at each site. Within the sites examined in this study, all carbon particles released within the model should be conserved within the model domain when resuspension processes are not activated. Once a carbon flux has been determined for a location an estimate of the likely sediment sulphide concentrations can be made that follows the equations presented by Hargrave et al. 2008. Biodegradation of waste may remove a portion of carbon from the system and is not currently incorporated in models. It was also suggested the impact of oxygen demand be considered. If the oxygen delivery to a site was known, the oxygen demand and hence the oxygen ration could be calculated.

It was noted that the simple model and DEPOMOD predictions of spatial extent of seafloor with elevated impacts were comparable.

There was a discussion concerning the incorporation of sediment deposition model and resuspension component in circulation models such as FVCOM. Sediment transport model has been examined in relation to tidal power projects within the Maritimes Region; however, it needs to be customized to aquaculture conditions. The sediment module within FVCOM is designed to work with cohesive or non-cohesive sediments. The model requires information pertaining to sheer stress, erosion rates and particle sediment values. It was recognized that work pertaining to FVCOM model is ongoing and would not be completed imminently. Once completed however, it is recommended that a comparison of results between FVCOM and DEPOMOD be completed.

Additional models, including BBLT and open source mohid were also discussed. The former was developed to examine the dispersion of drilling waste while the later is based on integrated coastal management principles and provided similar results to DEPOMOD. It was noted that parameters within the open source mohid model are flexible and can be changed.

Several DFO funded modeling projects geared toward aquaculture were identified and include:
1) quantifying benthic transport of aquaculture waste material for use in predictive models;
2) modeling sea lice dispersion and estimating encounter rates with juvenile Pacific salmon; and
3) critical threshold and dose dependent relationships for biodeposition from farmed mussels and benthic responses.

It was noted that work is being completed in high energy environments such as St. Mary's Bay. Once data is collected it can be applied to areas where the hydrodynamic model is available.

A participant noted that the results did not differ significantly when the resuspension component of DEPOMOD was not used. There was a concern that by increasing the accuracy of the model and adding complexity to a rudimentary model, its practically may be lost. In response, a participant commented that the ultimate goal is to try and understand where particles are being distributed in an effort to determine whether habitats require compensation. Research has shown that fine particles have an affinity for metals, the resuspension of which is a pathway to the benthic community. A clearer understanding of resuspension and dispersion would allow sustainable activity on a larger, far field scale; however, the importance of understanding resuspension in the near field was also noted, as this is what is currently regulated.

Draft Science Advisory Report Review

During the review of the science advisory report it was clarified that although the data was collected in the southwest New Brunswick, the results of the study are applicable to the Maritimes Region.

There was a discussion whether to include data pertaining to site G when presenting the relationship between sediment sulfide concentrations and DEPOMOD predictions of carbon deposition rates (using the feed rates at the time one sediment sampling without the resuspension component) within the science advisory report. Because feeding rates changed the month prior to sampling, site G was removed from the analysis as the feeding rate at the time of sampling was not appropriate for the analysis.

NEXT STEPS

Copies of the draft Science Advisory Report and proceedings will be circulated to participants.

ACKNOWLEDGEMENTS

The Chair thanked the assessment team for their hard work, the external reviewers for the comments, and the rest of the participants for their valuable contribution.

Appendix 1. Terms of Reference.

Sulphide Concentrations Around Select Aquaculture Sites in Southwest New Brunswick: Review of DEPOMOD Predictions Versus Observations

Maritimes Region Peer Review Process

Dartmouth, Nova Scotia
February 15-16, 2012

Chairperson: Peter Cranford

TERMS OF REFERENCE

Context

The risk of organic enrichment impacts to the seafloor associated with marine finfish aquaculture production have been studied extensively, and the relationship between carbon enrichment, sulfide levels and the biodiversity of benthic infauna organisms is well known. Measurements of surface sediment sulfide serve as an indicator of changes in benthic biodiversity. Processes leading to sediment accumulations are highly site specific and are dependant on currents, topography, resuspension, redeposition, and flocculation processes that affect the residence time of material in the water column and on the sediment surface as well as individual farm operating practices (Milligan and Law 2005).

The flux of organic material at lower levels can have both positive and negative impacts to the biodiversity of fish habitat, depending on the habitat type and the species affected. However, at higher rates, it is generally accepted that the flux of organic material to the seafloor is likely to pose a risk to fish habitat. Hargave et al. (2008) gives a basis for the classification of the oxic status of marine sediments providing a quantification of organic enrichment. Increases in organic enrichment result in a decrease in the oxic status and changes to the macrobenthic infauna community structure. Classification by oxic status can be used to describe the risk to the biodiversity of fish habitat.

Models that predict potential benthic impacts can be used by regulators during the assessment stage of an aquaculture development. To be effective, the model must incorporate all the variables that can affect the degree of carbon loading, including particle size, current speed, feeding rate, biomass in the cages, depth of the cage and the bottom. The most commonly used model of the processes leading to the deposition of particulate wastes from marine finfish aquaculture is the DEPOMOD model (Cromey et al. 2000; Chamberlain et al. 2005). Using the sinking characteristics and quantity of wastes along with hydrographic and bathymetric conditions, the model predicts the spatial deposition of waste.

This meeting will review the effectiveness of DEPOMOD in the Maritimes Region through the investigation of predictions versus monitoring results from select aquaculture sites in Southwest New Brunswick (SWNB). Alternative models will also be reviewed.

Objectives

The objectives of the meeting are:

- To determine effectiveness of DEPOMOD (i.e. how precise is the model when compared to post impact monitoring) in predicting:

(a) the intensity of organic enrichment from marine finfish aquaculture sites in the Maritimes Region,
(b) the geographic location of impact from marine finfish aquaculture sites in the Maritimes Region, and
(c) the magnitude of area (in m^2) of impact from marine finfish aquaculture sites in the Maritimes Region

- To identify any alternate model(s) that would more accurately predict organic enrichment intensity, magnitude and area of impact from marine finfish aquaculture sites in the Maritimes Region.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Document

Participation

- DFO Science
- DFO Habitat Management
- DFO Aquaculture Management Office
- NS and NB Provincial Government
- Industry

References

Chamberlain, J., D. Stucchi, L. Lu, and C. Levings. 2005. The suitability of DEPOMOD for use in the management of finfish aquaculture sites, with particular reference to Pacific Region. DFO Can. Sci. Advis. Sec. Res. Doc. 2005/35.

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Milligan T.G., and B.A. Law. 2005. The effect of marine aquaculture on fine sediment dynamics in coastal inlets, Chapter 12; *In*: B.T. Hargrave (Ed.), Environmental Effects of Marine Finfish Aquaculture, Handbook of Environmental Chemistry, Springer, Berlin Heidelberg New York (in press).[1]

[1] Proper Citation: Milligan, T.G., and B.A. Law. 2005. The Effect of Marine Aquaculture on Fine Sediment Dynamic in Coastal Inlets; pp. 239-252. In: Hargrave, B. [ed]. 2005. Environmental Effects of Marine Finfish Aquaculture. The Handbook of Environmental Chemistry. Vol. 5: Water Pollution. Springer, Berlin Heidelbrg New York, 467 pp.

Appendix 2. Agenda

Sulphide Concentrations Around Select Aquaculture Sites in Southwest New Brunswick: Review of DEPOMOD Predictions Versus Observations

Maritimes Region Science Advisory Process

Lewis King Boardroom
BIO, Dartmouth, NS

Chair: Peter Cranford

15-16 February, 2012

DRAFT AGENDA

15 February 2012 – Wednesday

9:00 - 9:15	Introduction (chair)
9:15 - 10:15	Overview of DEPOMOD and Study (site locations and conditions, sampling, etc)
10:15 - 10:30	Breaks
10:30 - 12:00	Review of DEPOMOD results
12:00 - 1:00	Lunch (not provided)
1:00 - 1:30	Review of DEPOMOD results
1:30 - 3:30	Comparison of DEPOMOD results with observed sulphide concentrations
3:30 - 3:45	Break
3:45 - 4:15	Comparison of DEPOMOD results with observed sulphide concentrations
4:15 - 4:30	Day 1 wrap up

16 February 2012 – Thursday

9:00 – 9:15	Review of Day 1
9:15 –10:30	Alternative models for predicting organic enrichment
10:30 –10:45	Breaks
10:45 –12:00	Alternative models for predicting organic enrichment
12:00 – 1:00	Lunch (not provided)
1:00 – end	Review of SAR

Appendix 3. List of Participants.

Sulphide Concentrations Around Select Aquaculture Sites in Southwest New Brunswick: Review of DEPOMOD Predictions Versus Observations

Lewis King Boardroom, BIO
15-16 February 2012

ATTENDEES

Name	Affiliation
Balch, Toby	NS Department of Fisheries and Aquaculture
Bennett, Aaron	NB Department of Environment
Bennett, Lottie	DFO Maritimes / CSA
Bugden, Gary	DFO Maritimes / OSD
Busby, Corina	DFO NCR / Aquaculture Science Branch
Chamberlain, Jon	DFO Pacific/OSDS
Chang, Blythe	DFO Maritimes / SABS
Cook, Dave	Sweeney International Management Corp.
Cranford, Peter	DFO Maritimes / ERD
Grant, Jon	Dalhousie University
Haigh, Susan	DFO Maritimes / SABA
Jacobi, Carol	DFO Maritimes/ HMD
Jayawardane, Aruna	Maliseet Nation Conservation Council
Law, Brent	DFO Maritimes / ERD
Lyons, Troy	NB Department of Environment
Losier, Randy	DFO Maritimes/ SABS
McLean, Mark	DFO Maritimes/ HMB
Page, Fred	DFO Maritimes / SABS
Parker, Edward	DFO Maritimes/ HMB
Parsons, Jay	DFO NCR / Ecosystems and Oceans Science Sector
Robichaud, Guy	DFO Gulf/ Oceans et Habitat
Rose-Quinn, Tammy	DFO Maritimes / AMO
Ross, David	DFO Central and Arctic/HMB
Szemenda, Mike	Cooke Aquaculture
Worcester, Tana	DFO Maritimes / CSA